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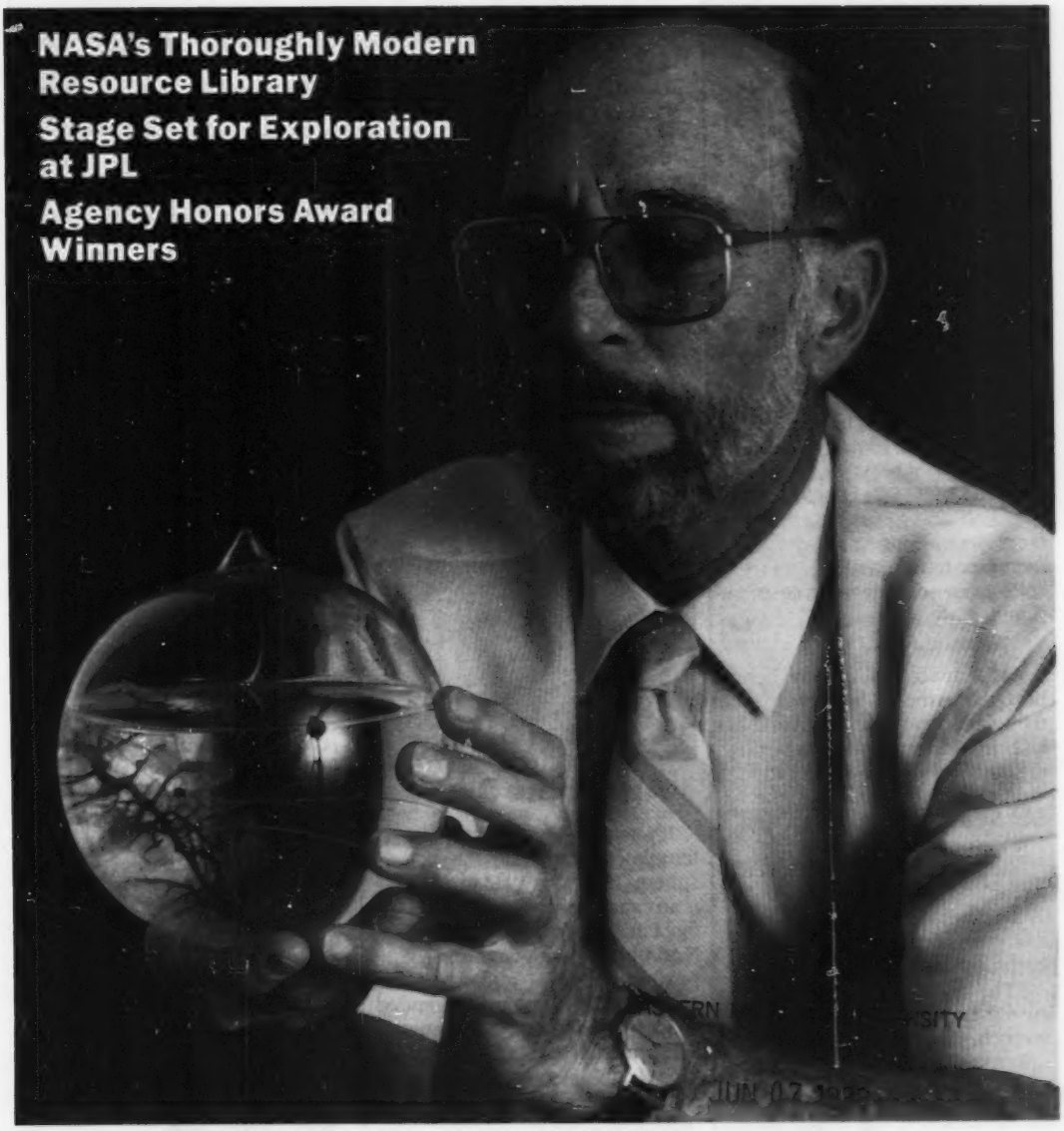

NASA's Thoroughly Modern Resource Library

Stage Set for Exploration at JPL

Agency Honors Award Winners

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JUN 07 1988

U. S. Depository Document

THIS ISSUE

Currently, the NASA Scientific and Technical Facility (STIF) serves as the central depository for approximately 3 million items of aerospace-derived technology. This collection of information on NASA space and aeronautical research accumulated over more than 25 years and is growing at the rate of 90 thousand items annually. A high-tech research library, STIF offers a variety of services for scientists and researchers. 4

JPL flight projects, past, present, and future, change our view of the cosmos. Magellan to Venus; Galileo to Jupiter; Ulysses to the Sun; Mars Observer to the red planet; CRAF and Cassini to asteroids, comets and Saturn; and TOPEX to study Earth's oceans. 12

The Lewis Research Center has recently opened its new Videoconferencing Facility (VCF). Joining the ranks of NASA's Langley, Marshall, and Johnson Centers' employees, Lewis employees will meet face-to-face with colleagues—cutting travel costs significantly. 14

As the Space Station crew member tightens the last bolt connecting the solar array to the trusswork, he loses his grip and a wrench begins to float away. He reaches for the wrench, but it slips through the gray fingertips of his gloved hand. The astronaut speaks:

"Retriever, quick-activate. Fetch wrench."

Retriever returns to the waiting astronaut and performs station-keeping maneuvers.

"Thank you, Retriever," says the crew member as he grips the wrench. "Release and go home."

Retriever lets go of the wrench, and returns to its hangar. 15

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About the Cover

JPL scientist Joe Hanson contemplates his creation, the ecosphere. This tiny world in a bubble is an example of a Controlled Ecology Life Support System (CELSS). NASA began work on the CELSS program in 1977 to research means of supporting humans in extended space travel and on other planets. "It seemed to me," Hanson said, "that I could demonstrate how shrimp-algae ecosystems might be of some real value."

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How Firm A Foundation?

By Noel Hinners, Associate Deputy Administrator for Institution

Over the course of the last 6 months I have spent a lot of time visiting NASA centers and Headquarters organizations with the objective of really understanding our NASA Institution—its people, facilities, and equipment. With the release of the President's Space Policy and the prediction that this is the year the Nation sets its course for leadership in space through the 1990s and beyond, I have reflected on the question—how solid is the NASA institutional foundation?

When addressing this question there is good news and bad news; most definitely there is a challenge and opportunity.

First the good news.

As I have visited the centers and received briefings, toured facilities, and spoken to NASA employees, it has reinforced my conviction that the strength of NASA is indeed its people. The energy, enthusiasm, and dedication of the NASA workforce never ceases to amaze me. Whether I am talking to someone processing the Shuttle, designing elements of the Space Station, testing aero models in the wind tunnels, studying scientific data from a mission, or providing the indispensable secretarial or administrative service, the common element I find is the pride in the NASA mission and a strong belief in the value of what each of us is doing. The commitment to excellence is undeniable. The aggregate NASA capability is exciting and befits thinking of it as a national resource.

The importance of a strong institutional foundation and NASA's need to revitalize it is agreed upon throughout the agency. This message has been successfully transmitted to OMB: they support NASA's goal of reinvigorating our institutional base. Work is now being done with staff and members on Capitol Hill to educate them on this same issue and to gain their support for the FY 1989 NASA institutional budget. This contains:

$1.915 million for R & PM, up from $1.743 million in FY 1988 (including an increase of 525 people), and

$285.1 million for C of F, an increase of $178.3 over FY 1988, with a major focus on restoration and modernization of our physical plant.

As NASA's full-time institutional advocate, I am dedicated to focusing the agency on the needs of the institution and to carrying forth programs that will develop a foundation not just for this year or the next, but for the years to come. We must take the long view—enhance our in-house technical capability, build facilities that support the future programs of NASA, and we need the tools and equipment to allow NASA to be at the leading-edge of technology in space, science, human exploration, and aeronautics.

Now the problems.

Of course the NASA attitude has always been there are no problems, just opportunities. And do we have opportunities in the institutional area!

The hiring freeze, necessitated by this year's funding shortfall in RPM, has been detrimental to our institutional recovery efforts. We've worked to relieve the constraints as soon as possible, realizing that commitments to new college graduates must be made.

Concerning new people, we were one of the only agencies in the Federal Government to receive a personnel increase in the President's budget (525). However, we still fell far short of our initial request (2,250) and are going back to OMB in May to continue the discussion of our needs. These are immediate needs and we worry that the United States is producing fewer and fewer scientific and engineering graduates. This is going to have a significant impact, not only on NASA, but on the country as a whole. We are actively looking at what long-range actions we can take to help solve this shortage.

The FY 1989 budget still has a long road to travel. The deficit environment is a difficult one in which to achieve a significant funding increase. That only increases our resolve to "pull it off."

NASA's ability to return the Shuttle safely to flight, develop and operate the Space Station, conduct forefront space science and applications missions, and continue high-quality aeronautics and space research programs all depend on the strength of the foundation—the NASA institution—and it takes money.

My part in strengthening our institution consists of listening to you the NASA employees, advocating the importance of the institution in every arena possible, seeing that we are capable of successfully implementing program commitments, and fighting battles in Washington.

Your part is to keep the enthusiasm and loyalty I have seen demonstrated from coast to coast, bring forward ideas to improve the agency, and sell the NASA program every chance you get—in schools, your community, and professional groups. Together we can build and maintain a solid foundation. ■

INSIDE NASA

NASA's Thoroughly Modern Resource Library: NASA Facility Celebrates 25 Years of Operation

In the information age, searching for simple facts can become unbelievably complex. Just knowing what to look for is not always enough. The Scientific and Technical Facility (STIF) was created 25 years ago to answer scientist's and researcher's questions about where to find scientific and technical information generated by NASA programs.

Currently, the NASA STIF serves as the central depository for approximately 3 million items of aerospace-derived technology. This collection of information on NASA space and aeronautical research has been accumulated over more than 25 years, and is growing at the rate of 90 thousand items annually. A high-tech research library, STIF offers a variety of services for scientists and researchers.

In 1987, NASA's Scientific and Technical Information Facility (STIF) marked its Silver Anniversary. On January 2, 1962, the NASA Office of Scientific and Technical Information contracted "to permit the setting up of the NASA central documentation facility. . ." The initial operating phase began in February 1962 when the first NASA documents arrived and were processed.

Data Base Increases Three-hundred Fold Since 1962; Growth Continues

In 1962 the document collection numbered approximately 10,000 titles. Currently, the NASA STIF serves as the central depository for approximately 3 million items of aerospace-derived technology. This collection of information on NASA space and aeronautical research was accumulated over more than 25 years and is growing at the rate of 90 thousand items annually. This data base of aerospace information is the heart of the NASA STI System established to fulfill the mandates of the Space Act of 1958.

The NASA STIF is one of three organizations responsible for collecting and processing NASA and non-NASA documents to be included in the STI data base. The other two organizations are the Technical Information Service, the American Institute of Aeronautics and Astronautics (AIAA), and the European Space Agency (ESA). Report literature collected and processed by the NASA STIF and by ESA is announced in the semimonthly abstract journal Scientific and Technical Aerospace Reports (STAR); a companion abstract journal, International Aerospace Abstracts (IAA) includes open literature items collected and processed by AIAA. These two journals form the basis of the STI data base.

JSC's Technical Monitor, Marty McDonough and Lead Librarian, Laura Chiu review guidelines for ARIN implementation.

Technology Utilization

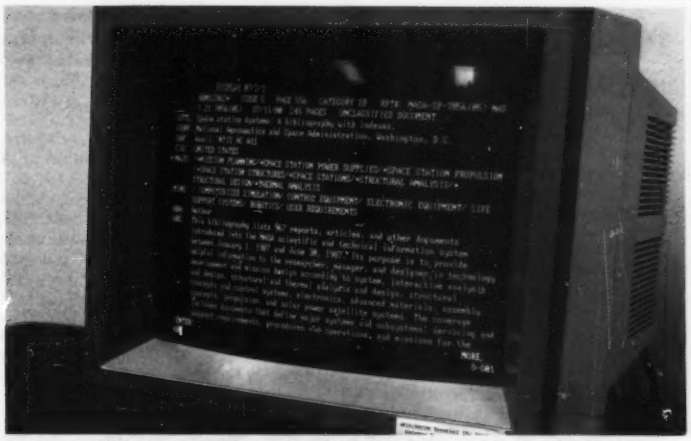
Through the Technology Utilization (TU) Office, the NASA STIF supports the NASA Headquarters' Office of Commercial Programs, and in particular, the Technology Utilization Division. The TU program is designed, in a nationwide effort, to increase public and private sector benefits through secondary application of aerospace technology. This twice-used technology represents an added dividend to the national investment in the space program and increased national productivity. The products and services provided by the TU program include NASA Tech Briefs, Spinoff, and the COSMIC Software Catalog.

"Information, please...": STI Products and Services

From the STI data base, the NASA STIF produces a variety of current awareness products and services. These are made available to scientists and engineers working at NASA centers, NASA contractors, other Government agencies and their contractors, and universities through local technical libraries. In addition to STAR, these products and services include a series of continuing and special bibliographies: Selected Current Aerospace Notices (SCAN); UPDATE and Automatic Document Distribution Service; and an online document ordering service. Reports are available in either paper copy or microfiche.

Online Search Capability—NASA/RECON Leads the Way

NASA/RECON is the Government's first major online bibliographic search system. It was installed at the NASA STIF by Lockheed and became operational in the spring of 1969. RECON, which stands for Remote Console, predates the National Library of Medicine's MEDLARS system, and was the basis for the Library of Congress' SCORPIO, Lockheed's DIALOG, JURIS at the Justice De-



Patrons who use ARIN to search for highly specialized science and technology literature will see the results of their searches on computer display terminals such as this one.

partment DOE/RECON, and other systems.

The NASA/RECON interactive retrieval system is designed to enable the user to conduct a literature search at a remote console of the entire NASA STIF data base. Users access the STIF data base through a dedicated or dial-up terminal. NASA/RECON offers quick access to comprehensive bibliographic information on approximately 3,000,000 reports, journal articles, and miscellaneous documents of worldwide origin and of special interest to the aerospace community. Online access to NASA/RECON is available to NASA centers, NASA contractors, other Government agencies and their contractors, universities and other organizations with aerospace-related contracts or grants. The NASA STIF provides an ongoing hot-line telephone service to all users. This service assists the user with specific, on- the-spot search problems.

State-of-the-art library catalogs—NASA/ARIN

The Aerospace Research Information Network (ARIN) is designed to give NASA center libraries state-of-the-art technology for library services.

The study of automation and integration of NASA centers' library functions was first undertaken in 1983. In 1984, the ARIN requirements study was completed and the project was approved by the NASA Automated Information Management (AIM) Council. During the spring of 1985, NASA directed the facility to purchase the NOTIS library automation software package from Northwestern University to be used as the core of the ARIN system. Phased ARIN implementation at 14 NASA libraries began in 1985. When fully implemented, the ARIN data base will include the book and journal holdings of eachof 14 participating libraries. These holdings will be represented by fully cataloged records from the Library of Congress, OCLC, and other bibliographic utilities. Ultimately, the ARIN system will provide an automated cataloging capability to all NASA center libraries that will permit the eventual replacement of a library's card catalog and the implementation of an online catalog, acquisitions and circulation and serials control and management information functions. ■

AGENCY HIGHLIGHTS

NASA Aviation Technology Provides Return on Investment

This spring, NASA received a $3.2 million check from United Technologies Corporation's Pratt & Whitney, West Palm Beach, Fla., as last year's recoupment for the agency's Refan and Engine Component Improvement (ECI) programs. The funds, which were presented to NASA Administrator Dr. James C. Fletcher by William C. Missimer, President of Pratt and Whitney's Government Engine Business, will be deposited in the U.S. Treasury.

The recoupment for the Pratt & Whitney portions of the Refan and ECI programs now total $16.1 million of a $25.5 million investment in cost-recovery contracts.

Alhough the NASA aeronautics program focuses on long-range, innovative research and technology development to advance future aircraft, occasionally NASA undertakes focused, near-term programs directed at specific national needs.

In extremely rare cases, these programs are end-product oriented and may offer significant potential for market sales by the contractor. The Refan and ECI programs were such examples and NASA required a recovery-of-cost provision in these contracts to recoup the Government investment.

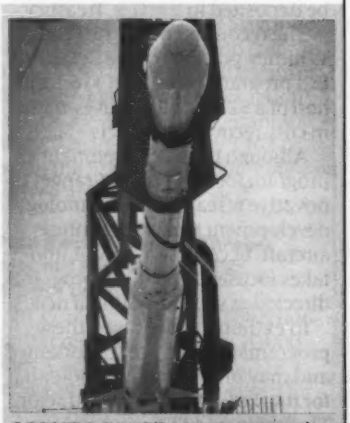
The Refan program was initiated in August 1972 to provide a retrofit option for FAA noise reduction rulemaking on narrow-body com-

mercial transports. The U.S. Government invested $15.3 million in cost-recovery contracts with Pratt & Whitney and for sales through 1986, the Government has recouped $9.3 million. Full recoupment of this Pratt & Whitney contract is estimated by 1990.

During the fuel crisis following the OPEC oil embargo of the 1970's, NASA entered into the ECI program with the goal of reducing fuel consumption of current engines by 5 percent over the life of the engine. This goal was met.

The U.S. Government invested $10.2 million in cost-recovery contracts with Pratt & Whitney and for sales through 1986, the Government has recouped $3.6 million. The incorporation of ECI technologies in the JT8D and JT9D turbine engines has saved 493 million gallons of fuel worth over $360 million.

The Refan and ECI programs have helped develop the technology that has been used to reduce aircraft noise and reduce fuel consumption of the Nation's transport aircraft. ■



SCOUT S-206C/SAN MARCO D/L MISSION — Successfully launched on March 25, 1988, from the San Marco range at 02:50:46 p.m. EST:

	PLANNED	ACTUAL
Apogee (KM)	615	632
Perigee (KM)	267	260
Inclination (DEG)	2.9	2.92

NASA Honor Awards

The Public Service Group Achievement Award is given to a group of nongovernment employees in recognition of outstanding accomplishments which have contributed substantially to the mission of NASA.

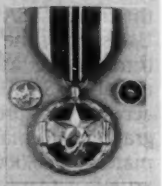
The Group Achievement Award is given in recognition of outstanding accomplishments which have been made through the coordination of many individual efforts, and have contributed substantially to the mission of NASA.

◁ The Public Service Medal is granted to any U.S. citizen, who is not an employee of the Federal Government, for exceptional contributions to the engineering design and development or management coordination of programs related to the accomplishment of the mission of NASA.

The Exceptional Service Medal is awarded for significant achievement or service characterized by unusual initiative or creative ability that clearly demonstrates substantial improvement in engineering, aeronautics, space flight, or space-related endeavors which contribute to the programs of NASA. ▷

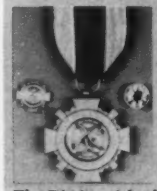
◁ The Equal Opportunity Medal is granted for outstanding achievement and material contributions to the goals of the equal employment opportunity programs either within Government or within community organizations or groups.

The Exceptional Engineering Achievement Medal is awarded for unusually significant engineering contributions toward achievement of aeronautical or space exploration goals. ▷



◁ The Exceptional Scientific Achievement Medal is awarded for unusually significant scientific contributions toward achievement of aeronautical or space exploration goals.

The Outstanding Leadership Medal is awarded for notably outstanding leadership which has had a pronounced effect upon the aerospace technological or administrative programs of NASA. ▷



◁ The Distinguished Service Medal recognizes a contribution representing substantial progress to aeronautics or space exploration in the interests of the United States.

The Distinguished Public Service Medal is the highest honor that NASA confers in recognition of non-Government employees whose meritorious contributions have produced results which measurably improve, expedite or clarify administrative procedures; scientific progress; or extraordinary efforts related to the accomplishment of the mission of NASA. ▷

Group Achievement Award

Advanced Digital Synthetic Aperture Radar Processor Development Team, *JPL*; **AFTI/F-16 Automated Maneuvering Attack System Joint Test Force,** *ARC*; **AFTI/F-111 Mission Adaptive Wing Flight Test Team,** *ARC*; **Airborne Oceanographic Lidar Project Team,** *GSFC*; **Air Traffic Control Automation Research Team,** *ARC*; **Australian Supernova Team, Headquarters; Basic Operations Manual Development Team,** *ARC*; **Biomass/Burn Biospheric-Environmental Impact Measurement Team,** *LaRC*; **Central Engineering Building Project Management Team,** *JPL*; **Combined Release and Radiation Effects Satellite Team,** *MSFC*; **Computational Chemistry Group,** *ARC*;

Dr. Robert Brown accepts award from Administrator James C. Fletcher on behalf of the Teacher In Space Program Team.

Computer Services Division, *KSC*; **Controlled Ecological Life Support System Team,** *KSC*; **Critical Evaluation Task Force,** *MSFC*; **Delta Launch Team,** *KSC*; **Distributed Management Information and Control System Development Team,** *JPL*; **Education and Awareness Branch,** *KSC*; **F-14 Variable Sweep Transition Flight Experiment Test Team,** *ARC*; **F-14 Variable Sweep Transition Flight Experiment Team,** *LaRC*; **Hypersonic Computational Fluid Experiment Team,** *LaRC*; **Industrial Safety Branch,** *KSC*; **Information Systems Standards Development Team,** *JPL*; **International Ultraviolet Explorer Operations and Engineering Support Team,** *GSFC*; **Joint Theater Level Simulation Development Team,** *JPL*; **Management Education Center—Management Operations and Support Team,** *GSFC*; **Manned Flight Awareness Panel,** *Headquarters*; **Meteorological Satellite Project Team,** *GSFC*; **NASA Balloon Program—Program Recovery Team,** *GSFC*; **National Aerospace Plane Program Team,** *GSFC*; **National Aerospace Plane Program Team,** *Headquarters*; **Network Assisted Coordinated Science/Coordinated Data Analysis.**

Workshop Development Team, *GSFC*; **Network Control Center—Building 13A—Facility Management Team,** *GSFC*; **New Efficient Narrow Bandwidth Titanium-doped Sapphire Laser Team,** *LaRC*; **Partial Payload Checkout Unit System Requirements Team,** *KSC*; **Photovoltaics Projects Personnel,** *JPL*; **Program Support Contract Source Evaluation Board,** *Headquarters*; **Prototype Facility Team,** *KSC*; **Shuttle Alternate Solid Rocket Booster Field Joint Design and Development Team,** *LaRC*; **Shuttle Logistics Project Team,** *KSC*; **Sixteen-foot Transonic Tunnel Fan Blade Repair Team,** *LaRC*; **Solid Rocket Booster External Tank Attachment Ring Redesign and Analysis Team,** *LaRC*; **Space Operations Task Force,** *Headquarters*; **Space Shuttle Orbiter Main Gear Tire Test Team,** *LaRC*; **Space Shuttle Orbiter Landing Simulation Team,** *MSFC*; **Space Station Facility Lease Team,** *JPL*; **Space Station Operations Task Force,** *Headquarters*; **Space Station Processing Facility Review Team,** *KSC*; **Space Station Thermal Test Bed Team,** *JSC*; **STS Payloads Return to Flight Review Team,** *KSC*; **Stratospheric Ozone/Temperature Analysis Group,** *GSFC*; **Teacher in Space Program Team,** *Headquarters*; **Tracking and Data Relay Satellite Very Long Baseline Interferometry Team,** *JPL*; **Transport Systems Research Vehicle Display Systems Engineering and Development Team,** *LaRC*; **UH-60 Accident Investigation Team,** *ARC*; **X-29 Forward Swept Wing Research Aircraft Project Team,** *ARC*.

Public Service Medal

William T. Arndt, *Lockheed Aeronautical Systems Company*; **Ralph Bernstein,** *IBM Corporation*; **Irene W. Bogolubsky,** *American Institute of Aeronautics and Astronautics*; **Charles Curry,** *Canadian Astronautics Limited*; **Martin O. Harwit,** *Cornell University*; **George R. Savage,** *Lockheed Space Operations Company*; **Harvey D. Tananbaum,** *Harvard/Smithsonian Center for Astrophysics*; **Robert B. Young, Jr.,** *Lockheed Engineering and Management Services Company.*

Exceptional Service Medal

Kenneth A. Adams, *LeRC*; **John R. Admire,** *MSFC*; **Robert L. Allen,** *LeRC*; **Gary B. Allison,** *Headquarters*; **Terry J. Armentrout,** *National Transportation Safety Board*; **Ray J. Arnold,** *Headquarters*; **Robert E. Austin,** *MSFC*; **Robert W. Austin,** *MSFC*; **William D. Balandis,** *ARC*; **Robert J. Barnini,** *KSC*; **James I. Bergstrom,** *LeRC*; **Joyce E. Bergstrom,** *LeRC*; **Robert F. Berry, Jr.,** *LaRC*; **Thomas J. Bicknell,** *JPL*; **Pamela M. Biegert,** *KSC*; **Bruce T. Blaylock,** *ARC*; **Robert L. Blount,** *JSC*; **Wesley J. Bodin, Jr.,** *GSFC*; **Parker Wayne Bogle,** *KSC*; **Charles F. Bolden, Jr.,** *JSC*; **Susie E. Bradhurst,** *Headquarters*; **Charles F. Bradshaw,** *LaRC*; **Vance D. Brand,** *JSC*; **David A. Brown,** *KSC*; **James F. Buchli,** *JSC* — **John A. Buckley,** *KSC*; **Frank M. Bugg,** *MSFC*; **Nancy L. Butler,** *Headquarters*; **William T. Callaghan,** *JPL*; **Manley L. Carter,** *JSC*; **Franklin R. Chang-Diaz,** *JSC*; **Gil Chisholm, Jr.,** *JSC*; **Mary L. Cleave,** *JSC*; **Lynn F.H. Cline,** *Headquarters*; **James L. Cole,** *JSC*; **Robert E. Coltrin,** *LeRC*; **Raymond R. Corey,** *KSC*; **Edward F. Coy,** *Headquarters*; **John O. Creighton,** *JSC*; **Salvatore J. Cristofano,** *Headquarters*; **Dale E. Crossman,** *Headquarters*; **Edward F. Cuddihy,** *JPL*; **John C. Curlander,** *JPL*; **John T. Dalton,** *GSFC*; **Dwain A. Deets,** *ARC*; **Frank P. DiGeorge,** *United States Navy*; **Raymond V. Dipboye,** *Headquarters*; **Donald F. Doerr,** *KSC*; **Bernard Michael Donahoe,** *ARC*; **Jack E. Drager,** *ARC*; **Patrick M. Duffin,** *JSC*; **Bonnie J. Dunbar,** *JSC*; **Palmer Dyal,** *ARC*; **Elsie M. Easley,** *JSC*; **Eugene G. Edmonds,** *JSC*; **Daniel D. Elleman,** *JPL*; **Jarrell R. Elliot,** *LaRC*; **Anthony W. England,** *JSC*; **Gwyn C. Faile,** *MSFC*;

Paul Weitz accepts Distinguished Service Award from Deputy Administrator Dale Myers.

Jose A. Fernandez, *ARC*; **Anna L. Fisher,** *JSC*; **William F. Fisher,** *JSC*; **Raymond L. Gause,** *MSFC*; **Daniel M. Germany,** *JSC*; **Jerry R. Goodman,** *JSC*; **Ronald J. Grabe,** *JSC*; **Richard R. Green,** *JPL*; **Stanley David Griggs,** *JSC*; **J.H. Guin,** *NSTL*; **Leon Guzinsky,** *MSFC*; **Ronald J. Harris,** *MSFC*; **Steven A. Hawley,** *JSC*; **Vernon T. Helms, III,** *LaRC*; **Wilma Joy Herndon,** *Headquarters*; **David C. Hilmers,** *JSC*; **Vera L. Hirschberg,** *Headquarters*; **Jeffery A. Hoffman,** *JSC*; **Tommy W. Holloway,** *JSC*; **John D. Holt,** *JSC*; **John R. Holtz,** *Headquarters*; **Keith L. Hudkins,** *Head-*

quarters; **Kenneth R. Human**, *NSTL*; **Wesley T. Huntress, Jr.**, *JPL*; **Charlie M. Jackson, Jr.**, *LaRC*; **James B. Jackson, Jr.**, *JSC*; **Bruce L. Jansen**, *KSC*; **Roger L. Jenkin**, *GSFC*; **James L. Jennings**, *KSC*; **Kenneth J. Jernigan**, *KSC*; **Nickolas Jevas**, *JSC*; **Virginia H. Jones**, *LaRC*; **Frederick A. Kern**, *LaRC*; **Joseph P. Kerwin**, *JSC*; **Ronald R. Kiessling**, *LeRC*; **Frank S. Kirkham**, *LaRC*; **Daniel L. Knight**, *JSC*; **Jacques D. Knox**, *GSFC*; **John P. Kochner**, *JSC*; **Gerald C. Ladner**, *MSFC*; **Cheever H. Lambert, Jr.**, *JSC*; **David C. Leetsma**, *JSC*; **Martin H. Leipold**, *JPL*; **Peter Leone**, *GSFC*; **Gerald S. Levy**, *JPL*; **James L. Lewis, Jr.**, *JSC*; **Erwin A. Lezberg**, *LeRC*; **John K. Lottinville**, *JSC*; **John M. Lounge**, *JSC*; **Shannon W. Lucid**, *JSC*; **Ralph Lutwack**, *JPL*; **Richard E. Maine**, *ARC*; **Samuel E. Massenberg**, *LaRC*; **Richard E. Mayo**,

Vera Hirschberg accepts Exceptional Service Award.

JSC; **James B. McCaulley**, *JSC*; **Alex A. McCool**, *MSFC*; **William E. McKissock**, *LeRC*; **Susan C. Mead**, *ARC*; **Robert A. Meyer**, *LeRC*; **Roland P. Michaelis**, *ARC*; **Carol L. Miller**, *JPL*; **Warner H. Miller**, *GSFC*; **JoAnn H. Morgan**, *KSC*; **Dorothy A. Morris**, *LeRC*; **James P. Murphy**, *ARC*; **Harold N. Murrow**, *LaRC*; **F. Story Musgrave**, *JSC*; **Steven R. Nagel**, *JSC*; **Harvey C. Needleman**, *GSFC*; **Deane W. Newland**, *LeRC*; **Cecil E. Nichols, Jr.**, *LaRC*; **Lester D. Nichols**, *LeRC*; **Billy W. Nunley**, *MSFC*; **Bryan D. O'Connor**, *JSC*; **Edward A. O'Connor**, *United States Air Force*; **John G. Oertel**, *KSC*; **Delores B. O'Hara**, *ARC*; **Gregory A. Opresko**, *KSC*; **Robert A.R. Parker**, *JSC*; **Edward L. Pavelka, Jr.**, *JSC*; **Kevil L. Petersen**, *ARC*; **Ronald L. Phelps**, *KSC*; **William E. Rains**, *JPL*; **John J. Reinmann**, *LeRC*; **Tamara S. Rimmer**, *JPL*; **Jerry L. Ross**, *JSC*; **Gilbert L. Roth**, *Headquarters*; **Philip B. Russell**, *ARC*; **Stanley R. Sadin**, *Headquarters*; **Larry D. Salter**, *MSFC*; **R. Stephen Saunders**, *JPL*; **Paul J. Schwindt**, *MSFC*; **John A. Scott-Monck**, *JPL*; **Margaret Rhea Seddon**, *JSC*; **Mahadeva P. Sinha**, *JPL*; **Earnest C. Smith**, *MSFC*; **Harold M. Smyly**, *MSFC*; **Sherwood C. Spring**, *JSC*; **William H. Stallings, III**, *GSFC*; **R. Rhoads Stephenson**, *JPL*; **Joseph R. Struhar**, *LaRC*; **Kathryn D. Sullivan**, *JSC*; **Leslie J. Sullivan**, *JSC*; **Parker O. Sullivan**, *MSFC*; **Norman E. Thagard**, *JSC*; **Roland W. Theisen**, *Headquarters*; **J. Brooks Thomas**, *JPL*; **John W. Thomas**, *MSFC*; **John O. Tresansky**, *GSFC*; **Thomas E. Utsman**, *KSC*; **Gerald B. Waggoner**, *MSFC*; **Narvin Warshay**, *LeRC*; **Edgar H. Weber**, *KSC*; **Ronald G. Weesner**, *MSFC*; **Donald E. Williams**, *JSC*; **Charles R. Yetter**, *Headquarters*; **Peggy L. Yohner**, *LeRC*; **Joseph A. Yuska**, *LeRC*; **James E. Zerega**, *GSFC*; **Roger C. Zwieg**, *JSC*.

Equal Opportunity Medal

Robert E. Eddy, *ARC*; **Gilbert A. Haynes**, *LaRC*; **Raymond E. Rose**, *Headquarters*.

Exceptional Engineering Achievement Medal

Billy R. Aldrich, *MSFC*; **Griffin Y. Anderson**, *LaRC*; **Billie B. Baker**, *MSFC*; **William C. Bryant, Jr.**, *GSFC*; **Robert A. Burns**, *GSFC*; **David R. Dargo**, *GSFC*; **Ronald A. Dawson**, *LeRC*; **Roger E. Diehl**, *JPL*; **Douglas L. Dwoyer**, *LaRC*; **Robert W. Farquhar**, *GSFC*; **Charles H. Griffin**, *KSC*; **Loren A. Gross**, *MSFC*; **Charles H. Gorve**, *KSC*; **Jack J. Hatfield**, *LaRC*; **David R. Howell**, *GSFC*; **Grady Sherman Jobe**, *MSFC*; **Charles O. Jones**, *MSFC*; **James F. Jordon**, *JPL*; **John Lambe**, *JPL*; **Martin Miculas, Jr.**, *LaRC*; **George D. Nelson**, *JSC*; **Howard G. Nelson**, *ARC*; **Donald L. Nored**, *LeRC*; **Robert F. Rice**, *JPL*; **Lawrence J. Schilling**, *ARC*; **Jack G. Slaby**, *LeRC*; **James A. Smith**, *JSC*; **Jaroslaw Sobieski**, *LaRC*; **Anthony J. Strazisar**, *LeRC*; **William E. Thornton**, *JSC*; **Hubert C. Vykukal**, *ARC*; **Michael J. Walsh**, *LaRC*; **Norman C. Wenger**, *LeRC*.

Exceptional Scientific Achievement Medal

Marion C. Bailey, *LaRC*; **Graeme A. Bird**, *University of Sydney, Sydney, Australia*; **John H. Cantrell, Jr.**, *LaRC*; **Alfred T.C. Chang**, *GSFC*; **Nitza M. Cintron**, *JSC*; **David J. Des Marais**, *ARC*; **Bertram D. Donn**, *GSFC*; **Mohammed Yousuff Hussaini**, *Institute for Computer Applications in Science and Engineering*; **Harold P. Larson**, *University of Arizona*; **Roy S. Lewis**, *University of Chicago*; **Jeffrey L. Linskey**, *University of Colorado*; **Michael J. Mumma**, *GSFC*; **Man Mohan Rai**, *ARC*; **David A. Randall**, *GSFC*; **William B. Rossow**, *GSFC*; **Bradford A. Smith**, *University of Arizona*; **Richard J. Terrile**, *JPL*; **Harold A. Weaver**, *Space Telescope Science Institute*; **Gregory S. Wilson**, *MSFC*; **Frank J. Zeleznik**, *LeRC*.

NASA Administrator presents certificate to Filament Wound Case project representative.

Outstanding Leadership Medal

Charles P. Blankenship, *LaRC*; **Daniel C. Brandenstein**, *JSC*; **Paul Thomas Breakfield**, *KSC*; **Jon R. Busse**, *GSFC*; **Aaron Cohen**, *JSC*; **Robert L. Crippen**, *Headquarters*; **Heinz Erzberger**, *ARC*; **Daniel J. Fink**, *D.J. Fink Associates, Inc.*; **Charles T. Force**, *Headquarters*; **Robert G. Forney**, *JPL*; **Robert L. Gibson**, *JSC*; **Carson M. Giesler**, *KSC*; **Joseph S. Heyman**, *LaRC*; **Jay F. Honeycutt**, *Headquarters*; **Frank S. Keipert**, *GSFC*; **William R. Kelly**, *JSC*; **Thomas J. Lee**, *MSFC*; **Joseph A. Lombardo**, *MSFC*; **Walter T. Murphy**, *KSC*; **C. Howard Robins, Jr.**, *Headquarters*; **Janet K. Ruff**, *GSFC*; **Brewster H. Shaw**, *JSC*; **Milton O. Thompson**, *ARC*; **Richard H. Truly**, *Headquarters*; **Hugh H. Wilson**, *MSFC*.

Distinguished Public Service Medal

Louis Lanzerotti, *Bell Laboratories*; **James R. Thompson, Jr.**, *MSFC*; **Murray Weingarten**, *Bendix Field Engineering Corporation*.

Distinguished Service Medal

Henry E. Clements, *Headquarters*; **Henry W. Hartsfield**, *JSC*; **Harriet G. Jenkins**, *Headquarters*; **Chester M. Lee**, *Headquarters*; **Paul J. Weitz**, *JSC*.

Incentive Awards Board Members

Noel W. Hinners, Chair
Robert O. Aller
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John E. O'Brien
Manuel Peralta
George A. Rodney
Deborah C. Green, *Executive Secretary* ■

Collier Trophy

The NASA Lewis Research Center and the NASA/Industry Advanced Turboprop Team was selected by the National Aeronautics Association (NAA) to receive the Robert J. Collier Trophy for 1987.

The trophy was awarded to the NASA/Industry Advanced Turboprop Team for producing a major achievement in aeronautics through the conception, technology development and flight verification of several advanced turboprop propulsion systems. These systems offer dramatic reductions in fuel usage and operating costs for subsonic transport aircraft. As such, they are expected to power an entire new generation of aircraft for both civil and military use.

Advanced turboprop propulsion systems offer dramatic reductions in fuel usage and operating costs for subsonic transport aircraft.

The initial concepts for these advanced turboprop systems were generated in the mid-1970's in response to rapidly increasing fuel prices resulting from the initial OPEC oil embargo. Advanced propeller designs, involving thin, highly swept and twisted blades, emerged from cooperative research at NASA Lewis and Hamilton Standard. NASA also worked with GE Aircraft Engines, under the leadership of Arthur P. Adamson, on the concept of a dual spool, gearless, counter-rotating engine, which has gained increasing industry acceptance. Through

The citation accompanying the Trophy reads: FOR THE DEVELOPMENT OF ADVANCED TURBOPROP PROPULSION CONCEPTS FOR SINGLE ROTATION, GEARLESS COUNTER ROTATION, AND GEARED COUNTER ROTATION UNDUCTED FAN SYSTEMS.

wind tunnel testing at NASA and other industry facilities, the feasibility of achieving major improvements in aerodynamic efficiency with these unique propellers operating at high speeds (Mach 0.8) was subsequently demonstrated. The technical expertise of all three of NASA's Aeronautical Research Centers (Ames, Langley and Lewis) and more than 40 industrial contracts and university grant efforts were successfully employed in this program. The Lewis Research Center acted as program coordinator.

This led to NASA collaboration with GE, Hamilton Standard and other companies to apply to technologies required for advanced performance improvements of these systems in ground flight tests. The program achieved its goals in 1987, with successful ground and flight-test verification of large-scale turboprop propulsion systems.

The Collier Trophy was established in 1911 and first presented to Glenn Curtis for his achievement in developing a seaplane. It is awarded annually by the National Aeronautics Association, administrator of the Trophy, for the greatest achievement in aeronautics or astronautics in America demonstrated by actual use in the previous year.

The NAA is the oldest national aviation organization in the United States. Throughout its 83-year history, NAA has maintained one prime purpose—to keep the United States first in air and space flight. ■

NASA Honor Awards Ceremony Remarks

Excerpts from Remarks by Paul Volcker, Chairman of the National Commission on Public Service; March 15, 1988

NASA can take pride in the way it has combined the best of management techques and highly skilled people into an organizational culture that, over the years, has produced remarkable achievements for both the public and private sectors of this nation.

I salute the many component elements of NASA who are honored today, from the public and private sectors, civilian and military elements, colleges and universities.

It is the rank and file employees of NASA themselves who deserve our special recognition—a group who, perhaps more than most in Government service today, know what a heavy obligation rests on them if the public's expectations are to be met—and know, as well, the sense of excitement when those expectations are in fact met. ■

Eight Finalists to Compete for the 1987 NASA Excellence Award for Quality and Productivity

Eight finalists have been selected by the NASA-wide Excellence Award Evaluation Committee to compete for the 1987 NASA Excellence Award for Quality and Productivity. The Evaluation Committee, comprised of representatives from all the NASA centers, NASA Headquarters, and the American Society for Quality Control, determined that the following companies would advance as finalists in the evaluation process:

—Bendix Field Engineering Corp., Columbia, MD
—Boeing Computer Support Services, Inc., Huntsville, AL
—General Electric Co., Spacecraft Operations-Valley Forge, Philadelphia, PA
—Lockheed Engineering & Management Services. Co., Houston, TX
—Lockheed Space Operations Company, Titusville, FL
—Pan Am World Services, Inc., National Space Technology Laboratories, NSTL, MS
—Rockwell International, Rocketdyne Division, Canoga Park, CA
—Rockwell International, Space Transportation Systems Division, Downey, CA

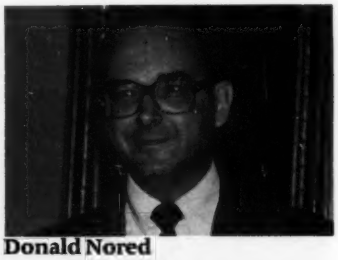
George A. Rodney, NASA's Associate Administrator for Safety, Reliability, Maintainability and Quality Assurance, announced the finalists on March 30, 1988 after an intense 6-month process which followed release of award application guidelines. The evaluation process is managed by SRM&QA's Quality and Productivity Improvement Programs Office.

The award is administered for NASA by the American Society for Quality Control, a Milwaukee-based professional association which specializes in the development, promotion and application of quality and quality-related technologies. The award is designed to recognize NASA prime contractors, subcontractors and suppliers for outstanding achievement in quality and productivity improvement. The awards process now advances to the third phase, validation team visits to finalists facilities to validate commitment and accomplishments. Visits are scheduled beginning on April 18 at Rocketdyne in Canoga Park, CA and concluding on May 26 with Pan Am World Services in NSTL, MS. A reception in Washington, DC for all the finalists is planned for the June/July timeframe.

Following validation team visits, NASA's Productivity Steering Committee headed by NASA Administrator, James C. Fletcher, will be briefed and will make final selection of award recipients. Fletcher will present the award in ceremonies at the recipients' location, approximately 6 weeks after announcement of recipients.

Key goals of the award are to institutionalize quality and productivity practices throughout NASA and the agency's contractors, and to transfer quality and productivity improvement methods of award recipient(s) to other contractors.

Recipients for 1986 were IBM Federal Systems Division of Houston, TX and Martin Marietta Manned Space Systems of New Orleans, LA, both recognized as outstanding contractors in the aerospace industry. ■



Donald Nored

Two Lewis Employees Named NASA's Engineers of the Year

On February 17, 1988, Norman H. Chaffee (JSC) and Donald L. Nored (LeRC) were named the Engineer of the Year from the National Aeronautics and Space Administration at an annual awards banquet sponsored by the National Society of Professional Engineers. The Federal Engineer of the Year Program provides recognition for the accomplishments of engineers who serve our Federal Government. Over 30 Federal departments and agencies were represented in the overall competition. Nored and Chaffee were recognized for their activities in professional/technical societies, honors and awards, civic and humanitarian activities and engineering achievements. ■

Goddard Scientist Wins Flemming Award

On April 7, 1988, the Jaycees notified NASA that Dr. Dorothy Kay Hall (GSFC) is a winner of the 1987 Arthur S. Flemming Award. The Flemming award honors 10 young men and women in the Federal Government who have made outstanding contributions in the administrative and scientific categories. Dr. Hall won in the scientific category for her contribution for interpreting satellite data of the Earth for snow and ice studies relating to global change. ■

NASA Managers Granted Presidential Award for Savings

Government overspending routinely makes the news. A joint team of industrial relations specialists at Langley Research Center and NASA Headquarters also is making headlines—but for the opposite reason. Four NASA managers have been applauded by the President of the United States for significant savings to the U.S. Government.

The Langley Research Center Contract Cost Savings Team has been granted a Presidential Management Improvement Award for their efforts which have resulted in approximately $3.5 million in tangible savings at the Center. Langley team members, Arthur R. Friend, Robert L. Huffman, Jr., and Howard R. Puckett, Jr., and Sam C. Geiser, NASA Headquarters, were honored at a White House ceremony March 4.

Ronald Reagan, in his inaugural address, promised the American people that a major priority of his administration would be to make Government work efficiently and economically. "I am confident that Federal employees will continue to play a very significant role in controlling Government expenses and helping to reduce the cost of Government to all Americans."

The team was commended for their efforts to control costs under Langley Research Center construction and support service contracts. Through cooperative efforts with the U.S. Department of Labor, local data was gathered assisting issuance of periodic wage determinations specifying minimum wages and fringe benefits payable under Government contracts.

Resultant savings of taxpayer dollars merited the team a Presidential Letter of Commendation, a prerequisite to the Presidential Management Improvement Award.

Approximately 250 letters of commendation were awarded. The seven most exceptional contributions were recognized by Presidential Management Improvement Awards. The Director, Office of Personnel Management, and the Director, Office of Management and Budget, advise the President on final selections.

The Contract Cost Savings Team follows in the footsteps of the Lay Electric Power Negotiating Team, which was awarded a Presidential Management Improvement Award in 1986. ■

Presidential Management Improvement Awards were presented in the Old Executive Office Building, Washington, D.C. Shown are (L to R) NASA Deputy Administrator, Dale D. Myers; award winners Howard R. Puckett, Jr., Robert Huffman, Jr., Sain C. Geiser and Arthur R. Friend; Office of Personnel Management Director, Constance Horner and Office of Management and Budget Director, James Miller.

Award Winners

AWARD:
Dr. Hugh L. Dryden Memorial Fellowship

THIS YEAR'S NASA WINNER:
Dr. John H. Cantrell, LaRC

FOR:
Post baccalaureate education in discipline applicable to science, astronautics, and space administration.

AWARDED BY:
National Space Club. Applications reviewed by award panel.

HISTORY:
Est. 1966. The scholarship is awarded in memory of Hugh L. Dryden who, during his distinguished career in Government service, played a uniquely important role in the development of science-based technology. Award first given to Johns Hopkins University, Dr. Dryden's alma mater. Eligibility is limited to applicants in Government service with NASA.

AWARD:
The Astronautics Engineer Award

THIS YEAR'S NASA WINNER:
James B. Odom, Former MSFC Director, Science and Engineering Directorate

FOR:
Outstanding contributions to the national space program in the field of engineering or engineering management.

AWARDED BY:
National Space Club.

HISTORY:
Est. 1959 to recognize space engineers.

AWARD:
Black Engineer of the Year

THIS YEAR'S NASA WINNERS:
Christine M. Darden, Aerospace Engineer, Advanced Vehicles Division, LaRC; Dr. Donald O. Frazier, Chemical Engineer AST, Aerospace Polymeric Materials, MSFC; L. Kerry Mitchell, Aerospace Engineer, ARC.

FOR:
Contributions of blacks in the areas of science, engineering, and technology.

AWARDED BY:
U.S. Black Engineer Magazine

HISTORY:
Est. 1987 ■

CENTER HIGHLIGHTS

Stage Set for an Exciting New Era in Space Exploration

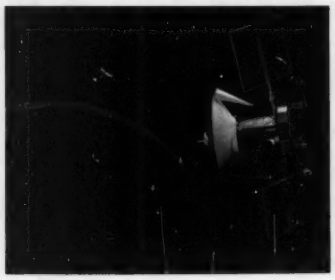
JPL flight projects—past, present, and future—change our view of the cosmos. JPL is involved in missions to send Magellan to Venus; Galileo to Jupiter; Ulysses to the Sun; Mars Observer to the red planet; CRAF and Cassini to asteroids, comets and Saturn; and TOPEX to study Earth's oceans. JPL is also studying missions to return to the Moon, to study debris in Earth orbit, and a mission to rove the surface of Mars and return samples of its soil to our laboratories.

By R.C. House, JPL

It would be difficult to look back over the Jet Propulsion Laboratory's (JPL) history and find a time when so many flight projects were in preparation as there are now.

Flight Project Preparation: Magellan to Venus

Scientists working on the Magellan project are preparing to put their spacecraft aboard a Shuttle in the spring of 1989. Magellan will be equipped with a synthetic-aperture radar, the only instrument capable of seeing through the thick clouds of Venus and provide high-resolution maps of the planet's surface. Magellan also will carry a radar altimeter to measure elevations of the surface features on Venus.



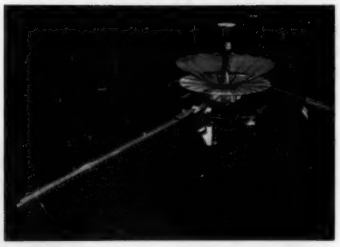
Magellan

The primary mission for Magellan will last 9 months in Venus orbit, and in that period will map more than 70 percent of the planet's surface.

Galileo to Jupiter

While Magellan coasts toward Venus, Galileo will be prepared for launch aboard the Shuttle in November 1989.

The unique route to Jupiter that was designed for Galileo is a result of the Challenger loss and a reexamination of NASA's launch procedures. Early plans called for launching Galileo out of the Shuttle's cargo bay on a liquid fuel Centaur G-prime upper stage. But the agency decided to use a solid propellant inertial upper stage (IUS) instead. Since the IUS is not capable of sending Galileo directly to Jupiter, the spacecraft will go first to Venus, then back toward Earth, then to the asteroid belt and past Earth once more before finally arriving at Jupiter in November 1995. Two asteroid flybys are planned.



Galileo

Galileo consists of two parts—an orbiter and an atmospheric probe. Both are heavily instrumented to measure the planet, its magnetic field, and satellites. The orbiter will release the probe about 150 days before arriving at Jupiter. The probe will descend into Jupiter's

atmosphere and make direct measurements for about 1 hour or more before pressure and heat destroy it.

Galileo will circle Jupiter for at least 20 months, studying the planet and its intense magnetic field. During that time the spacecraft will orbit the planet 11 times and make about 15 near encounters with planet-sized Galilean satellites.

While Galileo is making its leisurely way through the solar system, still another project will be prepared for launch, this time to the poles of the Sun. Called Ulysses, the project is a joint effort of NASA and the European Space Agency (ESA). Launch is now scheduled for late 1990.

Ulysses to the Sun

Ulysses will explore the Sun's poles, which never have been investigated before. It is a difficult enough feat, since no launch vehicle can boost a spacecraft 90 degrees out of the ecliptic plane in which Earth orbits the Sun. Ulysses will therefore fly first to Jupiter. To get there, it will be launched from the Shuttle's cargo bay atop an IUS and a Payload Assist Module

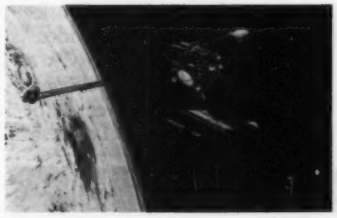
Ulysses

(PAM-S). Once it reaches Jupiter, the giant planet's gravity will provide the required change of direction. When Ulysses emerges from behind Jupiter the spacecraft will be headed for the Sun's southern pole. Then the Sun's gravity will pull Ulysses toward the north pole. The mission is scheduled to end after each solar pole has been scrutinized once.

In addition to studying the poles of the Sun, Ulysses will measure the solar wind at all latitudes, will aim its instruments outward in a search for energetic particles coming from other stars, and will, at special times, search for gravity waves.

Mars Observer to the Red Planet

The fourth planet from the Sun is Mars, an old and cherished friend of JPL. The Lab flew four Mariners to Mars and participated in the Viking Mars project.



Mars Observer

The next spacecraft that will go to Mars is also a JPL effort, called Mars Observer. Mars Observer will be launched in the fall of 1992 and will arrive at Mars about a year later. It will study the planet's surface and its atmosphere.

Mars Rover Sample Return

The most ambitious of all projects is the Mars Rover Sample Return (MRSR), which would send spacecraft to traverse the Martian surface, collect samples of rock and soil and then return them to Earth. Mars Rover Sample Return could be launched before the turn of the century.

This look at the Laboratory's past, present, and future flight projects offers contrasts. Once the Shuttle flies again, JPL projects will be well represented in the queue for launch. Work is going on in many other directions, including development of spacecraft that could ride to space aboard expendable launch vehicles as well as the Shuttle.

The science that will result from JPL efforts will follow a historical precedent: it will change our view of the cosmos and our place in it.

Possible Future Projects: Comet Rendezvous Asteroid Flyby

The realm of future projects is led by a mission called CRAF— Comet Rendezvous Asteroid Flyby. CRAF would encounter one or more asteroids (depending on funding and the starting year) and then rendezvous with a comet. The spacecraft would do some fancy information flying with the comet for several years while cameras and other instruments—including an instrumented surface penetrator—would study the comet at extremely close range, in some cases as close as a few hundred meters. CRAF would make use of a new spacecraft design, called Mariner Mark II.

Cassini to Saturn

Another mission that would use Mariner Mark II is in the planning stages at JPL. That is the Cassini mission to Saturn.

Cassini will orbit Saturn and will place an atmospheric probe, provided by the European Space Agency, into the atmosphere of Titan, Saturn's largest satellite. The probe also will study Titan's surface.

Mission to the Planet Earth

While the Laboratory is known principally for exploring other planets, JPL also is working on missions to study the most important planet of all—our own Earth.

The Ocean Topography Experiment (TOPEX) will be launched aboard a French Ariane launch vehicle in 1991. The mission is a planned 3- to 5-year international effort to map the circulation of the world's oceans. It will combine satellite measurements with surface and aerial observations.

In addition to ocean studies from orbit, JPL is investigating two interesting missions that fall into a class called QuickSat. QuickSats can be put together rapidly and launched aboard available Atlas launch vehicles. That means a QuickSat could be ready for launch by 1990. ■

Videoconferencing Facility to Cut Costs, Enhance Communications

By Eileen Fritsch, LeRC

A recently constructed state-of-the-art videoconferencing facility (VCF) is expected to save the Lewis Research Center hundreds of thousands of dollars annually in travel costs while enabling more employees to meet face-to-face with their colleagues at other NASA facilities.

At first glance, the meeting room appears to be simply an attractive conference room. But the new facility also has many of the features of a modern TV studio. The VCF is equipped with all the cameras, microphones, soundproofing, lighting and computer networks needed to transmit live broadcasts of groups assembled at LeRC to a group assembled in a similar facility at another NASA center. At the same time, the group at Lewis sees a live broadcast of the group assembled at the other center.

The broadcasts appear on two large screens in the front of the conference room. One screen is used to watch the conferees at the distant site. The other screen enables conferees at both sites to simultaneously view a videotape, 35 mm slides, or hard- copy graphics.

Videoconferences also can be videotaped for viewing later by employees unable to attend at the scheduled time.

Currently, meetings can be scheduled with employees at Goddard, Langley, Marshall, or Johnson. But within the next year, the VCF will enable Lewis employees to meet with colleagues at nine more sites: Headquarters, Wallops, Kennedy, Michoud, Ames, Dryden, White Sands, JPL or Vandenberg. In the future, the VCF will be linked to commercial videoconferencing networks.

The VCF also will serve as a studio, from which messages from the Director or others can be quickly arranged and sent center-wide.

Benefits

In addition to helping Lewis reduce travel budgets, the VCF will enable busy managers to attend important meetings without spending a lot of time away from their offices. Also, people who are unable to participate in meetings at other NASA sites, due to budget limitations, can now take part. ■

Equipped with carefully concealed cameras, microphones, soundproofing, lighting and computer equipment, the VCF can be used to transmit live broadcasts of groups assembled here to a group in a similar facility at another NASA center. The screen on the left is used to watch the conferees at the other center. The screen on the right enables conferees at both sites to simultaneously view a videotape, 35 mm slides, or other hard-copy graphics.

How to Schedule A Videoconference

To schedule a videoconference at Lewis, call the Lewis Network Control Center. The control center staff will fill you in on some of the policies and procedures for using the VCF and ask that you confirm your meeting request with a work order. Initially, at least a 1-week notice will be required to arrange a videoconference. But this lead time is expected to decrease in the future.

EVA Retriever

by Kelly Humphries, JSC

Fetching a wrench may not seem like an important task for an autonomous robot but what if the object drifting away from the Space Station were a crew member? What if it were the only replacement for a malfunctioning piece of critical equipment? Or what if the free-flying wrench were to collide with the Station on its next orbit?

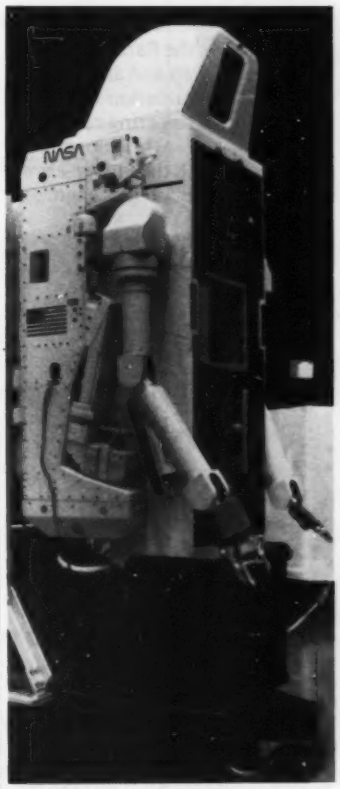
A team of JSC engineers is developing a solution to the anticipated problem of accidental separation, a problem that is bound to be encountered when people are living and working in orbit continuously. The team already has put together a Phase I voice-controlled demonstrator that can use an MMU to move about on the air-bearing floor, locate targets, distinguish between a wrench and an astronaut, reach for and grapple the target and return it to a "home" base.

The current prototype is a conglomeration of existing equipment and technology, much of it contributed by the various divisions supporting the project. It uses Votan voice recognition and response, Remotec robotic arms, a three-fingered hand and on-board software developed in-house, an Odetics 3-D laser mapper, Inmos transputers, Intel bit-bus interfaces, and a modified McDonnell Douglas missile-borne video tracker.

In Phases II and III of the 3-year project, the team plans to enhance its test bed capabilities by improving the EVA Retriever's subsystems, progressively increasing its intelligent autonomous capabilities, and enabling it to avoid moving obstacles and retrieve moving targets. Once the ground demonstration program is finished, the next steps in the EVA Retriever's development would be to test it in simulated microgravity and in orbit from the Space Shuttle before deploying an operational model from the Space Station.

"The need," according to Gerald Reuter, manager of the ground demonstration project, "is that when astronauts are out working on the Station, there is a chance they might become detached and need a quick response system that can go out and get them."

The target also could be a valuable piece of equipment that's needed immediately to finish an EVA task. At a minimum, a crew member would have to return to the Space Station to get a replacement. At worst, the crew might have to wait until a resupply Space Shuttle could bring a replacement from Earth.



EVA robot doesn't wag its tail, but boy, can it fetch.

"There's no Sears up there that you can walk down and buy a tool from," said Test Director Keith Grimm of the Systems Development and Simulation Division.

"The Retriever could evolve into an EVA helper," added Cliff Hess, the project's Crew and Thermal Systems Division engineer. "Another payoff on this is you can probably get some real productivity gains, where you essentially have another EVA crewman out there, as opposed to a teleoperated system where you're probably going to tie up a crewman operating that system."

While the team's primary purpose is to solve an anticipated problem, it is also attempting to break new ground in robotics and artificial intelligence. Those areas were identified by JSC as important technologies for future space operations and exploration of our solar system.

"If you think about it, we don't really have an intelligent autonomous system in place today, anywhere. This will be an attempt to provide such a system," Reuter said.

"This could really change the way people think about robots," said Kathy Healey, chief of the Intelligent Systems Branch.

"Twenty years ago researchers thought in 20 years we'd have totally autonomous intelligent robots. Now everybody has slipped back into teleoperated systems. If we could fly something in 10 years that was highly autonomous, it would make a big difference in the shape of robotics and the kinds of things people try to do with robots," Healey said. "There's one group of people who think robots can do a lot more, and then there's another group that's saying robots can't do that much and you guys have really bitten off more than you can chew," she added. "We probably have. But it doesn't matter because wherever we end up we will be a lot farther along than anybody thought we could ever get."

The biggest challenge of putting together the EVA Retriever prototype for ground demonstrations was getting the separate parts—the MMU, the arms, the hand, the tracker and the distributed software modules—to work together as one.

"Individually they worked fine," Grimm said. "But when you put them all together in the same system and tried to get them to communicate, that was probably the most difficult part. We spent many, many weeks on that."

The solution to integrating the robot was, ironically, people.

"As with any big project, requirements and specifications are interpreted differently," Healey said. "And then when something doesn't work, you get the people to sit down and talk it out and figure out where the differences are and then somebody makes a change."

In Phases II and III and beyond, the emphasis will shift to increasing the robot's autonomy.

"One of the major challenges is getting it to look at the environment and respond appropriately of its own volition—giving it the intelligence to make its own decisions," Grimm said. "The only thing you'll have to do in Phase III is tell it to go."

On the other hand, humans will need to retain control of artificially intelligent robots. Many science fiction stories have dealt with the need for "robot laws" that prevent autonomous automatons from harming humans through action or inaction, and the designers of the EVA Retriever are addressing those concerns.

"You do not want an autistic robot, you want a robot that will always respond to human beings," Healey said. "The effective way to do that is to always be able to intervene and redirect the robot or stop it dead in its tracks." ■

Reprinted from the April 8, 1988, issue of Space News Roundup, a publication of NASA's Lyndon B. Johnson Space Center, Houston.

Q&A

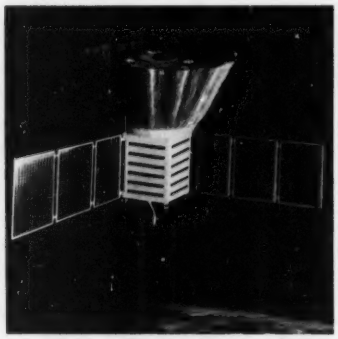
COBE

The following questions and answers are excerpted from interviews conducted for NASA's radio program, The Space Story.

For thousands of years, the stars have challenged us to unravel their mysteries. In 1989, NASA plans to launch a satellite called the Comsic Background Explorer, or "COBE", which may answer one of our oldest and most fundamental questions: How did the universe really begin?

Q What could COBE see that might fundamentally change our understanding of the universe?

A From its orbit 559 miles above the Earth, COBE will map and analyze the far away, faint radiation which experts say is the lingering echo of the "Big Bang" — the colossal explosion in which the universe was born some 15 billion years ago.



COBE will be able to see back to a time millions of years ago.

According to Dr. John Mather, the head of the COBE science team at NASA's Goddard Space Flight Center, "The COBE will be able to see back to the time when the atomic nuclei joined with the electrons to form complete atoms, a million years after the explosion. We will be able to see directly everything that has happened since then. The formation of galaxies and the formation of stars will be apparent to us."

"Black holes might actually have been important as the things that cause galaxies to exist. We might be able to see some evidence that they were hot, burning objects early on. There may be something that preceded galaxy formation in the clusters of galaxies. There could have been gigantic structures early on. We'd like to know about that and COBE has a chance to see things if they're there."

Quasars

For nearly three decades, bizarre celestial objects known as "Quasars" have tantalized astronomers with their strange behavior. Many of these fantastic cosmic furnaces are small enough to fit comfortably within our solar system, yet each one burns with the energy of a billion suns.

Q Why do quasars hold such a fascination for scientists?

A Dr. Herman Marshall, project astronomer for the extreme ultraviolet explorer satellite which NASA plans to launch in 1991, explains, "Maybe it's that search for the monster that lies inside a galaxy.

"Maybe it's just that they are one of the hardest objects to understand at present, because you can do a number of observations and still not get that much closer to what's going down deep inside . . . as far as I know, the concensus among the majority of astronomers is that, if you had to pin them down, if you had to twist their arms and say, 'what's a quasar?' they would say probably there is a giant black hole. We're talking huge . . .we're talking thousands of times as massive as the Sun, maybe millions or billions of times as massive as the Sun."

NASA NEWS CAPSULES

The PRESS RELEASE SUMMARY is intended for use in NASA field center house organs and other internal communications. Press summaries are NASA news releases edited by the Internal Communications Branch, Office of Communications.

NASA to Seek Space Aboard Commercially Developed Facility

NASA announced that it will seek offers to lease, to the U.S. Government, useable volume and related services in a commercially developed space facility for 5 years beginning before the end of fiscal year 1993. At least 30 percent of the facility will be available for commercial use.

The facility will be deployed, checked out and serviced periodically on orbit by Space Shuttle crews. The facility will provide a crew-tended, shirtsleeve work space, and also be able to operate in an untended, free-flying mode providing a microgravity environment for periods of 4 to 6 months.

(from Hdqs. Release #88-25)

■

NASA to Acquire Second Space Shuttle Carrier Aircraft

NASA announced plans to acquire a Boeing 747-100 jetliner to serve as a second Space Shuttle carrier aircraft (SCA) for the space transportation system.

The 231-foot long aircraft will be modified to carry Shuttle orbiter vehicles from landing sites to orbiter processing facilities at the Kennedy Space Center. Modifications will be made by Boeing at their manufacturing facilities in Wichita, Kansas. The 747-100 is nearly identical to the original SCA and was selected to minimize costs associated with modifications and operation.

(from Hdqs. Release #88-28)

■

JPL Team Studies Motion of Tectonics Plates

An international team of researchers, coordinated by NASA's Jet Propulsion Laboratory, Pasadena, Calif., is using satellites to study how the Earth's tectonic plates move in the Caribbean Sea and Central and South America.

Tectonic plates account for such geological phenomena as the formation of mountain ranges and volcanos and geodetic studies such as this experiment are expected to aid scientists working on earthquake prediction techniques.

The experiment will span several years, allowing researchers to chart the motions of dozens of land sites in 16 countries using signals from orbiting navigation satellites.

The experiments began with researchers traveling in January and February to more than 50 sites around the world, with most scientists studying in areas ranging from San Andres Island to Quito, Ecuador, and from the Galapagos Islands to the town of Barinas, Venezuela.

Each team carries an electronic receiver designed to pick up signals from seven NAVSTAR satellites operated by the U.S. Department of Defense. The orbiting spacecraft were launched under the Global Positioning System program.

(from Hdqs. Release #88-30)

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Advanced Large-Scale, Low-Speed Centrifugal Compressor supports NASA's efforts to advance small gas turbine engine technology at Lewis.

NASA Administrator says 1989 "Make or Break" Year

Dr. James Fletcher, NASA Administrator, testified before the House Subcommittee on Space Science and Applications on the agency's proposed FY 1989 budget. He made several points in his oral and written testimony:

- This is a crucial year for NASA which could "make or break" the Nation's space program.
- The budget contains funds to build up the rate of Shuttle flights in 1989 and to start to fly off the backlog of vital defense and science missions. If effective access to space cannot be provided, hopes for future U.S. space leadership will be extinguished.
- The budget provides the buildup of Space Station funding required in the second year of hardware development. Unless adequate funding is provided, the development teams will have to be disbanded and hopes for a permanent laboratory and base in space deferred indefinitely or cancelled.
- If the funds requested for advanced technology are not approved, the necessary technological foundation for future achievements will not be built and the goal of long-term U.S. space leadership will "become an idle dream."

(from Hdqs. Release #88-31)

■

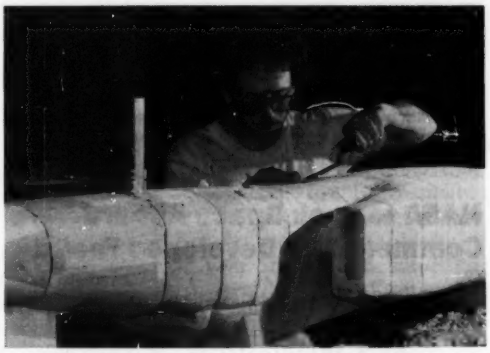
NASA Prepares New Abort Landing Sites for Shuttle Missions

Preparations are underway to bring online two new abort landing sites in northwestern Africa. These sites will be used as contingency landing facilities in the event of a transatlantic abort during the launch of STS-26 and subsequent missions.

The new sites are located near Ben Guerir (40 miles north of Marrakech), Morocco, and Banjul, Gambia.

At Ben Guerir, construction to rejuvenate the surface of the runway has begun. In addition, foundations for Shuttle approach and landing aids are being laid at the new sites.

Processing is underway at Kennedy Space Center to ship support equipment to the new locations. Each location will receive about 10 personnel transportation vehicles, a microwave landing system, four sets of PAPI lights, two sets of Ball/Bar lights, two sets of flashing strobe lights, generators for power, portable satellite communications systems, automated weather stations and other support equipment and tools.



Langley Modelmakers: The Merlins Who Transform Concepts Into Reality. A Langley technician completes preparatory tooling of a wooden pattern for an X-29A radio-controlled drop model.

The total number of transatlantic abort sites comes to four with the addition of these new sites and the continued use of sites at Zaragoza Air Base and Moron Air Base In Spain.

(from Hdqs. Release #88-34)

■

NASA Designing Radar to Track Arctic Ice Flow, Study Alaska

NASA's Jet Propulsion Laboratory is designing a sophisticated radar receiving system to help image and track Arctic ice floes and study the remote areas of Alaska and its surrounding seas.

The overall system, including a 10-meter receiving antenna called the Alaska SAR Facility, will be located at the University of Alaska Fairbanks and will be implemented by JPL and managed by the Geophysical Institute of the university.

The facility is scheduled to be fully operational in time for the April 1990 launch of the European Space Agency satellite called E-ERS 1. The facility also will receive data from Japan's J-ERS 1 satellite and the Canadian-led multinational RADARSAT satellite.

In a paper describing the system, JPL scientist, Dr. Frank Carsey, and others said the polar oceans and the ice packs have significant effect on the global climate system. They are sites of great heat loss because of the large temperature differences between the cold polar atmosphere and the relatively warm oceans.

(from Hdqs. Release #88-35)

HUMAN FACTORS

Peralta Named to NASA Management Post

Manuel (Manny) Peralta has been appointed associate administrator for Management, NASA Headquarters. He had been serving in this post, in an acting capacity, since April 28, 1987.

Prior to joining NASA, Peralta had over 30 years of industry experience in business, engineering and project management. He was a senior executive with Exxon responsible for the implementation of world-wide capital projects and Exxon's European Engineering Office. His career also has involved corporate-level business management and several special assignments including a review of the Defense Department's weapons acquisition programs as a member of the President's Private Sector Survey on Cost Control (the Grace Commission).

Peralta is a vice-chairman of the American Standards Institute and a board member of the Engineering and Construction Contracting Division of the American Institute of Chemical Engineering. ■

Astronaut Parker to Head Space Flight/Space Station Integration

Veteran astronaut Robert A. R. Parker, Ph.D., has been assigned temporary duty in the Office of Space Flight, NASA Headquarters.

Parker will serve as director of the Space Flight/Space Station Integration Office, reporting directly to the Associate Administrator for Space Flight, Rear Adm. Richard H. Truly.

The Space Flight/Space Station Integration Office was established in 1987 to facilitate integration of the Space Station and its unique requirements into the space transportation system. The office coordinates the exchange of information between the two programs and serves as a forum for resolving technical and programmatic issues.

Prior to his selection as a scientist-astronaut in 1967, Parker was an associate professor of astronomy at the University of Wisconsin. After joining NASA, he served as a member of the astronaut support crews for Apollo 15 and 17. Parker also served as program scientist during the three manned Skylab missions. In November and December of 1983, he made his first space flight as mission specialist on STS-9, the first Shuttle/Spacelab mission.

Parker replaces former director E. William Land who retired in January. ■

Odom Named Associate Administrator for Space Station

James B. Odom has assumed the duties of Associate Administrator for Space Station, NASA Headquarters.

Odom comes to NASA Headquarters from the Marshall Space Flight Center, where he was director of the Science and Engineering Directorate, a position he has held since November 1986. Prior to that, he was manager of the Space Telescope project.

At the Marshall Space Flight Center, Odom has held various engineering and technical management positions. He was actively involved in the development of Earth satellites and unmanned space probes prior to his assignment as chief of the Engineering and Test Operations Branch for the second stage of the Saturn V launch vehicle. In 1972, he was appointed manager of the External Tank Project in the Space Shuttle Projects Office. In 1982, he became deputy manager for production and logistics in the Shuttle Projects office. He became manager of the Space Telescope Office in 1983. ■

Abbey Named Deputy Associate Administrator for Space Flight

George W.S. Abbey has assumed the duties of Deputy Associate Administrator for the Office of Space Flight, NASA Headquarters.

Abbey comes to Headquarters from NASA's Johnson Space Center, Houston, where he has been special assistant to the Center Director since November 1987. Prior to that, he had been Director of Flight Crew Operations.

Abbey began his NASA career in 1967 as technical assistant to the manager of the Apollo Spacecraft Program and in December 1969, he became technical assistant to the Center Director. In January 1976, he was named Director of Flight Operations, where he was responsible for operational planning and for overall direction and management of flight crew and flight control activities for all manned space flight missions. He remained in this position until 1983 when he became Director of the newly-formed Flight Crew Operations Directorate, where he continued to be responsible for all Space Shuttle flight crews and center aircraft operations. ■

ANOTHER DIVIDEND FROM AIR & SPACE

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

NASA Technology Aids Diabetics

The medical benefits of using NASA space technology became a reality in late 1986 for F. Jackson Piotrow of Bethesda, Md., when he became the first insulin-dependent diabetic to have a computerized insulin pump surgically implanted in his abdomen at Baltimore's Johns Hopkins Hospital.

Since Piotrow's surgery, 16 other diabetics have had the insulin pump implanted in operations performed at the Johns Hopkins Hospital or the University of California at Irvine Medical Center as part of the clinical trial of the new device.

Once PIMS passes its clinical trial, the device will free an estimated 1 million insulin-dependent diabetics from their daily injections of the pancreatic hormone.

The programmable implantable medication system (PIMS) was developed by the Johns Hopkins University Applied Physics Laboratory (APL) using technology employed on NASA's Viking missions to Mars and made available through the agency's technology utilization program.

Recipients of the PIMS no longer have to inject themselves daily with insulin. Instead, the PIMS releases a pre-programmed amount of concentrated insulin into the body at a constant rate on command from the diabetic. To vary the amount of insulin, the individual holds a small radio transmitter over the implant and pushes a specific number corresponding to a program held in the PIMS computer memory.

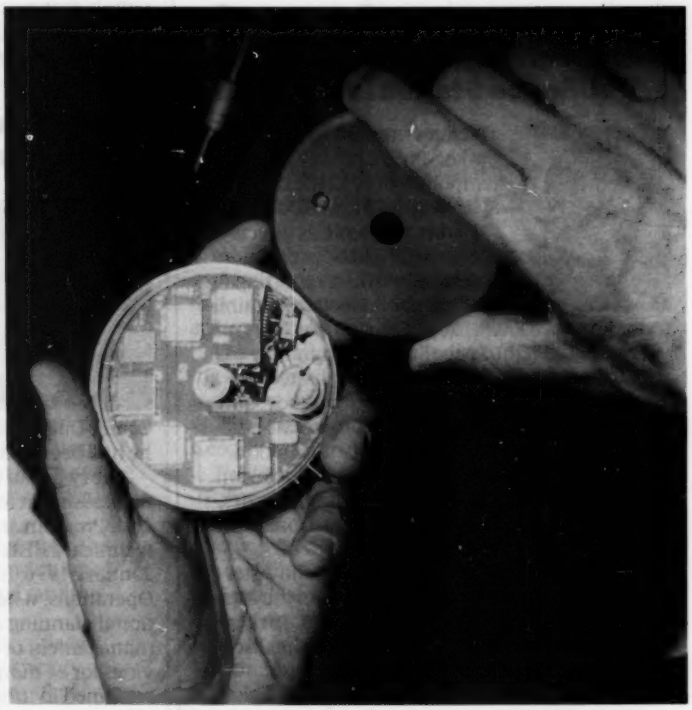
The size and shape of a hockey puck, the PIMS communication system also includes NASA technology that assures reliable programming of the device by radiotelemetry techniques. Much of this technology was obtained from NASA Goddard Space Flight Center's Small Astronomy Satellite Program.

Goddard provided program management, technical expertise and funding of $2 million to stimulate the transfer of this NASA technology toward the development of PIMS. Donald S. Friedman, head of Goddard's Commercial Programs Office, is the PIMS program manager.

Encased in a titanium shell, PIMS holds about 2.5 teaspoons of insulin — a 3-month supply easily replenished without hospitalization.

The system operates on a 3.6-volt battery which should last more than 5 years. Safety features have been incorporated to prevent excess delivery of insulin. The PIM's construction also allows new programming, as well as remote data collection by a physician via telephone.

The PIMS system was invented by and developed under the direction of Robert E. Fischell, Chief of Technology Transfer at APL. ■



Robert E. Fischell holds his invention Programmable Implantable Medication System (PIMS). The PIMS unit, when implanted in the body, can automatically deliver precise pre-programmed amounts of insulin over long periods of time.